

Document of
The World Bank

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Report No: 61703-MNA

PROJECT APPRAISAL DOCUMENT
ON FIVE PROPOSED GRANTS FROM THE
GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US\$1.05 MILLION
TO THE LEBANESE REPUBLIC

IN THE AMOUNT OF US\$1.05 MILLION
TO THE HASHEMITE KINGDOM OF JORDAN

IN THE AMOUNT OF US\$1.05 MILLION
TO THE KINGDOM OF MOROCCO

IN THE AMOUNT OF US\$1.05 MILLION
TO THE CENTRE REGIONAL DE TELEDETECTION
DES ETATS D'AFRIQUE DU NORD

IN THE AMOUNT OF US\$ 394,545
TO THE ARAB WATER COUNCIL

UNDER THE FIRST PHASE OF THE MULTICOUNTRY
REGIONAL COORDINATION ON IMPROVED WATER RESOURCES MANAGEMENT
AND CAPACITY BUILDING PROGRAM

IN A GLOBAL AMOUNT EQUIVALENT TO US\$4.59 MILLION

May 18, 2011

Sustainable Development Department
Middle East and North Africa Region

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CURRENCY EQUIVALENTS
(Exchange Rate Effective May 18, 2011)

Currency Unit = Lebanese Pounds (LBP)
LBP1509.5 = US\$1
US\$ = SDR 0.628

Currency Unit = Jordan Dinars (JOD)
JOD0.708 = US\$1
US\$ = SDR 0.628

Currency Unit = Egyptian Pounds (EGP)
EGP5.951 = US\$1
US\$ = SDR 0.628

Currency Unit = Moroccan Dirham (MAD)
MAD7.928 = US\$1
US\$ = SDR 0.628

Currency Unit = Tunisian Dinar (TND)
TND1.374 = US\$1
US\$ = SDR 0.628

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

APL	Adaptable Program Loan
AWC	Arab Water Council
CRTEAN	Centre Régional de Télédétection des Etats d’Afrique du Nord
CRTS	Centre Royal de Télédétection Spatiale
CNT	Centre National de Télédétection
CNRS	Conseil National de la Recherche Scientifique
CQS	Consultant Qualifications
DA	Designated Account
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FM	Financial Management
FMS	Financial Management Specialist
FO	Financial Officer
IPCC	International Panel on Climate Change
IFR	Interim financial report
IBRD	International Bank for Reconstruction and Development
ICB	International Competitive Bidding
ICBA	International Center for Biosaline Agriculture
ICARDA	International Center for Agricultural Research in the Dry Areas

IDA	International Development Association
IPSAS	International Public Sector Accounting Standards
IW	International Waters
GEF	Global Environment Facility
GRACE	Gravity Recovery and Climate Experiment
LCS	Least Cost Selection
MENA	Middle East and North Africa
METAP	Mediterranean Environmental Technical Assistance Program
MODIS	Moderate Resolution Imaging Spectro-radiometer
MOPIC	Ministry of Planning and International Cooperation
MOWI	Ministry of Water and Irrigation
NARSS	National Authority for Remote Sensing and Space Science
NASA	National Aeronautics and Space Administration
NCB	National Competitive Bidding
NGO	Non-governmental organization
ORAF	Operational Risk Assessment Framework
PDO	Project Development Objective
POM	Project Operations Manual
PMU	Project Management Unit
RPMU	Regional Project Management Unit
QCBS	Quality and Cost Based Selection
QBS	Quality Based Selection
SBD	Standard Bidding Documents
SOE	Statement of Expenditures
SSS	Single Source Selection
TAC	Technical Advisory Committee
TOR	Terms of Reference
UN	United Nations
USAID	United States Agency for International Development
WA	Withdrawal Application
WISP	Water Information System Platform

Vice President:	Shamshad Akhtar
Regional Director:	Jonathan Walters
Sector Director:	Laszlo Lovei
Sector Manager:	Francis Ato Brown
Task Team Leader:	Claire A. Kfour

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PAD DATA SHEET

FIRST PHASE OF THE REGIONAL COORDINATION ON IMPROVED WATER
RESOURCES MANAGEMENT AND CAPACITY BUILDING PROGRAM – (APL 1)
TO THE

LEBANESE REPUBLIC, HASHEMITE KINGDOM OF JORDAN, KINGDOM OF
MOROCCO, CENTRE REGIONAL DE TELEDETECTION DES ETATS D'AFRIQUE DU
NORD AND ARAB WATER COUNCIL

PROJECT APPRAISAL DOCUMENT

MIDDLE EAST AND NORTH AFRICA Sustainable Development Department

Date: May 18, 2011 Regional Director: Jonathan Walters Sector Director: Laszlo Lovei Sector Manager: Ato Brown Team Leader: Claire A. Kfour Project ID: P117170 Lending Instrument: GEF	Sectors: General water, sanitation and flood protection sector (100%) Themes: Water resource management (100%) Environmental Assessment Screening Category: C
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Project Financing Data:

Proposed terms:

☐ Loan ☐ Credit ☒ Grant ☐ Guarantee ☐ Other:

Source	Total Amount (US\$M)
Total Project Cost:	5.644
Co-financing:	
PLN:	
Total Bank Financing:	
IBRD (GEF Grant)	5.644
APL-1	4.594
APL-2	1.05
IDA	

Program Recipients:

Lebanese Republic ('Lebanon')
Hashemite Kingdom of Jordan ('Jordan')
Kingdom of Morocco ('Morocco')
Centre Régional De Télédétection Des Etats D'Afrique Du Nord ('CRTEAN') based in Tunisia
Arab Republic of Egypt ('Egypt')
Arab Water Council

Implementing Agencies and Contacts:

Conseil National de la Recherche Scientifique (Lebanon) - Dr. Mouin Hamze
 Ministry of Water and Irrigation (Jordan) – Dr. Maysoon Zoubi
 Centre Royal de Télédétection Spatiale (Morocco) - Dr. Driss El Hadani
 National Authority for Remote Sensing and Space Sciences (Egypt) – Dr. Ayman El Dessouki
 Centre Régional de Télédétection des Etats de l'Afrique du Nord (Tunisia) – Dr. Neji Fekih
 Arab Water Council - Dr. Mahmoud Abu Zeid

Estimated Disbursements (Bank FY/US\$ m) for APL-1

FY	2011	2012	2013	2014	2015	2016
Annual	0.1	1.3	1.7	1.2	0.29	0
Cumulative	0.1	1.4	3.1	4.3	4.59	4.59

Project Implementation Period: Start: 2011 End: 2015

Expected effectiveness date: June 30, 2011

Expected closing date: May 31, 2015

Does the project depart from the CAS in content or other significant respects?	<input type="radio"/> Yes <input checked="" type="radio"/> No
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If yes, please explain:

Does the project require any exceptions from Bank policies?	<input type="radio"/> Yes <input checked="" type="radio"/> No
Have these been approved by Bank management?	<input type="radio"/> Yes <input type="radio"/> No
Is approval for any policy exception sought from the Board?	<input type="radio"/> Yes <input checked="" type="radio"/> No

If yes, please explain:

Does the project meet the Regional criteria for readiness for implementation?	<input checked="" type="radio"/> Yes <input type="radio"/> No
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Program Development Objective:

The proposed program development objective is to improve water resources and agricultural management and planning within and across beneficiary countries based on quantitative and spatial-based decision making tools.

Project description

A multi-country Adaptable Program Loan (GEF Grant) APL, the program will finance the technical assistance and hardware/software infrastructure required to build the capacity of local governments to improve local and regional water resources and agricultural management using Earth observation tools. Phase 1 of the APL will support activities in each of Lebanon, Jordan, Morocco, the Arab Water Council and the Centre Regional de Télédétection des Etats d'Afrique du Nord (CRTEAN). Phase 2 of the APL will support the same activities in Egypt and will be triggered upon the Government of Egypt's readiness to negotiate project documents.

Each phase will comprise the following Project components:

Component 1: Improved Water Resources and Agricultural Management

Component 2: Capacity Building and Project Management

Component 3: Regional Integration and Cooperation

Safeguard policies triggered?	
Environmental Assessment (OP/BP 4.01)	<input type="radio"/> Yes <input type="radio"/> No
Natural Habitats (OP/BP 4.04)	<input type="radio"/> Yes <input type="radio"/> No
Forests (OP/BP 4.36)	<input type="radio"/> Yes <input type="radio"/> No
Pest Management (OP 4.09)	<input type="radio"/> Yes <input type="radio"/> No
Physical Cultural Resources (OP/BP 4.11)	<input type="radio"/> Yes <input type="radio"/> No
Indigenous Peoples (OP/BP 4.10)	<input type="radio"/> Yes <input type="radio"/> No
Involuntary Resettlement (OP/BP 4.12)	<input type="radio"/> Yes <input type="radio"/> No
Safety of Dams (OP/BP 4.37)	<input type="radio"/> Yes <input type="radio"/> No
Projects on International Waters (OP/BP 7.50)	<input type="radio"/> Yes <input type="radio"/> No
Projects in Disputed Areas (OP/BP 7.60)	<input type="radio"/> Yes <input type="radio"/> No

Conditions and Legal Covenants:	
Description of Covenant	Date Due
All Recipients: Project Management Units in place	By Grant Effectiveness for each individual Recipient
Lebanon, Jordan, Egypt, AWC and CRTEAN: Legal Agreements fully executed and ratified by respective parties and related legal opinions.	By Grant Effectiveness for each individual Recipient
Lebanon and Egypt: Subsidiary Agreement between the Borrower and the implementing agency plus related legal opinion.	By Grant Effectiveness for each individual Recipient
AWC: Establishment of Technical Advisory Committee	Within six months of Grant Effectiveness
All Recipients: Project operations manual describing the internal controls and procedures applicable to the grant (including scholarship program) finalized and adopted by Recipients.	By Grant Effectiveness for each individual Recipient
All Recipients: Yearly audit report and management letter for the project sent to the Bank	Within six months after the end of each fiscal year

I. Strategic Context

A. Regional Context

1. The scarcity of freshwater in most countries of the Middle East and North Africa (MENA) region is an increasingly acute problem, particularly as populations grow, rapid urbanization continues and the pressure to shift water from agriculture (which consumes over 84% of the region's water resources on average) to domestic and industrial uses increases. Fourteen of twenty MENA nations are classified as being in water deficit, defined as less than 500 m³ of renewable water supply per capita per year. The Intergovernmental Panel on Climate Change further reports an expected precipitation decrease over the next century by over 20% for large parts of the MENA region, a likely increase in the frequency and severity of droughts and a reduction in groundwater recharge rates.

2. Furthermore, over 60% of the MENA region's water supply flows across international borders which further engenders political tensions between communities, stakeholders and countries and therefore necessitates equitable appropriation of available water among riparians. This underlines the need for regional cooperation in the Arab world's water resource management.

3. Quantitative measurements of the location, availability, quality and current/future uses of local and regional water resources are critical for sound decision making and management. To date however, the high cost of in-situ data collection and analysis, the lack of data management systems and the non-standardized methods and protocols for data collection, management and validation across MENA have obstructed the development and effective use of reliable local and regional water information systems.

4. Modern advances in technology (including geographic information systems, data assimilation, and modeling techniques among others) and space based remote sensing techniques now enable the routine collection of accurate water data. Data collected in this manner can provide measurements over areas where no data have otherwise been available and at greatly reduced costs as compared to traditional methods. Such data can also easily be turned into valuable information through maps and graphs that allow stakeholders and water managers to make better, more informed decisions for water management and planning.

B. Sectoral and Institutional Context

5. Water data collection has traditionally been made through in situ (i.e. in place) measurements of the major fluxes and storages (rain, stream flow, groundwater, snow, reservoir capacity etc). In many MENA countries however, in-situ datasets tend to be unreliable or incomplete due to the cost of collection, temporal and spatial variability. Stakeholders in the water, agriculture, planning and other sectors thus have limited access to reliable real-time information on important issues including water availability, evapotranspiration, agricultural water consumption and the impact of climate change on water resources.

6. A number of Water Information System Platform (WISP) tools have been developed by commercial entities, academic centers and institutions¹ and are able to significantly enhance the frequency, relevance, consistency and application of water data collection. WISP tools, which include remote sensing equipment (such as satellite receiving stations, digital map analysis software and others), land surface models and land data assimilation systems, can operate without relying on ground based data and thus are not limited by human and technical resources, geographic constraints and political boundaries. Ground based data that does exist should be used to validate the remotely-sensed data and will improve the results. The validation step is critical to convince users that the data produced by the tools can be used with a high degree of confidence.

7. These tools have been successfully used across the United States, parts of Africa and South America in drought and flood management, groundwater flux and evapotranspiration mapping, and in monitoring the impacts of climate change on hydrological environments. Specifically, WISP tools enable: (i) significant improvements in water managers' ability to monitor changes in water availability, including surface and groundwater storage, river runoff, and related land use changes retrospectively and in near real-time; (ii) improved prediction of regional hydrological impacts of climate change scenarios; and (iii) the creation of a forum for cooperation and data sharing among nations including coordinated management of transboundary water resources, estimation of recharge rates of oversubscribed shared aquifers, and optimization of the response to droughts and floods among other advantages.

8. Under this project, various WISP tools will be transferred to and implemented in each of the remote sensing agencies and/or water ministries of Lebanon, Jordan and Morocco. The CRTEAN, an international organization headquartered in Tunisia² with the mandate to further the use of remote sensing across North African States, has furthermore partnered with the Tunisian Ministry of Agriculture and Hydraulic Resources, the Algerian National Agency for Hydraulic Resources and Tunisian National Center for Remote Sensing, and will apply regional WISP tools (such as NASA's GRACE Satellite outputs) to assess regional water resources management issues on shared regional aquifers.

9. The WISP toolbox and associated technical assistance to each implementing agency will be custom configured to optimize local capacity in addressing high priority water resource needs. WISP tools will also be tailored to adapt to existing remote sensing infrastructure and staff capacities within each implementing agency to ensure complementarity to existing systems and sustainability in the long term. A detailed description of the various WISP tools and the local applications of priority in each implementing agency is provided in Annex II.

10. To catalyze the regional dissemination of water data and enhance international communication and cooperation among implementing agencies and stakeholder ministries, the Arab Water Council, through its project grant, will: (i) finance regional dissemination workshops

¹ Examples include the National Aeronautics and Space Administration (NASA), the Goddard Space Flight Center (GSFC), National Oceanic and Atmospheric Administration (NOAA), US Department of Agriculture, University of Wisconsin-Madison and others.

² The CRTEAN was established as an international organization pursuant to the October 6, 1990 constitutive act by five North African states of People's Democratic Republic of Algeria, Socialist People's Libyan Arab Jamahiriya, Kingdom of Morocco, Islamic Republic of Mauritania and Republic of Tunisia.

among implementing agencies; (ii) publish yearly summary reports on the impact of climate change on regional water resources; and (iii) liaise between the implementing agencies and international and regional experts in remote sensing and associated fields. The Arab Water Council, an established partner of the Arab League's Ministerial Council for Water and other regional institutions across MENA and a regional non-profit organization operating under its constitution effective December 17, 2009 and its by-laws and presidential decision number 157 dated 2009 of the Arab Republic of Egypt, will play an important role in enabling effective cooperation among regional partners and in ensuring that regional opportunities for improved water resources management are effectively captured, documented and communicated to regional stakeholders.

C. Higher Level Objectives to which the Program and Project Contributes

11. The GEF Global Objective of the proposed project is to better manage local and regional water resources and reduce the threat of land degradation and climate change to vulnerable agricultural production systems and water resources in and across the project areas while developing options to address land-based pollution affecting the Mediterranean Sea. The project is in line with both (i) the long-term objective of the GEF's International Waters Focal Area: "to foster international, multi-state cooperation on priority water concerns" and (ii) with GEF's Strategic Program for International Waters "to balance overuse and conflicting uses of water resources in surface and groundwater basins that are transboundary in nature".

12. The proposed program is consistent with the national priorities of each of Lebanon, Jordan, Egypt, Morocco and Tunisia to improve the sustainability of water resources management. It is also consistent with CRTEAN's goals and priorities. The program forms part of the World Bank Arab World Initiative (AWI), which emphasizes cooperative regional solutions to major challenges such as water resource management, food security and climate change nexus. Indeed, this is the first project being presented to the Board under AWI. Finally, the proposed project is fully consistent with the World Bank *"Water Resources Sector Strategy – Sustaining Water for All in a Changing Climate"*, particularly in improving client countries' access to technologies to increase the availability and dissemination of information for results-based decision making.

13. The rationale for Bank involvement in the program lies primarily in its ability to apply innovative solutions to development challenges in the water sector by collaborating with renowned specialist technical institutions - such as NASA and top academic institutions in the field of remote sensing and hydrology. By mobilizing the international and regional expertise required to operationalize various WISP tools and validate output data on water availability, agricultural trends and climate change impacts among others, the World Bank will assist project countries to identify scale-up and investment opportunities for the improved management of water resources in and within project countries. The Bank is furthermore already extensively involved in many of MENA's water resources management-related research, projects and reforms – many of which include international riparians. The proposed project, through the Bank's convening power and established relationships with MENA countries, will thus compound the positive development impacts of existing and ongoing initiatives in the water sector across MENA.

II. Program Development Objectives

A. PDO

14. The proposed program development objective is to improve water resources and agricultural management and planning within and across beneficiary countries, based on quantitative and spatial-based decision making tools.

15. The beneficiary countries of this program will be: Hashemite Kingdom of Jordan, Kingdom of Morocco, Lebanese Republic, and the Republic of Tunisia in Phase 1 and the Arab Republic of Egypt in Phase 2.

B. Beneficiaries

16. The direct beneficiaries of the proposed program are the local and regional remote sensing institutions and the ministries of water, irrigation, agriculture and planning, regional water stakeholders, local farmers and the citizens of each of Lebanon, Jordan, Egypt, Tunisia and Morocco (approximately 136 million people, half of which are estimated to be women) which will benefit from improved access to real-time drought and flood monitoring outputs, improved crop yield and local and regional groundwater estimates among others.

C. Project Development Objectives

17. The project development objective (APL1) is to improve water resources and agricultural management and planning within and across beneficiary countries, based on quantitative and spatial-based decision making tools. It has the same development objective, beneficiaries and PDO level results indicators as the program, however they specifically pertain to Lebanon, Jordan, Morocco, the AWC and CRTEAN.

D. PDO Level Results Indicators

18. Achievement of the development objective will be assessed through the following key performance indicators:

- WISP operational in at least 3 of 4 implementing agencies
- Number of major water resources decisions made taking into consideration WISP tools.
- Regional project data portal developed and operational (according to GEF International Waters (IW):LEARN guidelines).

19. Recipient countries will benefit from the expected project outcome of enhanced capacity in remote sensing and will be able to better:

- Compile past and current water conditions to inform improved water policy decisions;
- Generate maps of soil wetness and estimates of irrigation water use for large scale agricultural productivity assessments and planning;

- Provide water balance data for a regional and temporal perspective to identify local, short term and long term trends in water usage anomalies;
- Monitor extent and severity of droughts;
- Estimate current water storage conditions in the uplands of river basins to improve river flow predictions and;
- Evaluate potential increases/decreases in irrigation water requirements under various climate change scenarios to inform the planning of agricultural policies.

III. Program and Project Description

A. Program and Project components

20. The Regional Coordination on Improved Water Resources Management and Capacity Building Program will consist of three components described below and implemented in Lebanon, Jordan, Morocco, AWC and CRTEAN under Phase 1 (APL1) and Egypt in Phase 2 (APL2).

Component 1: Improved Local Water Resources and Agricultural Management (US\$ 3.06 million)

21. *Component 1 will comprise: (a) the purchase, installation and validation of various WISP tools and other ancillary equipment to remote sensing centers and stakeholder agencies and institutions in each of Lebanon, Jordan, Morocco and the CRTEAN and its partners; and (b) Support to the selected stakeholders on the application of WISP tools to pertinent research issues in local and regional water resources, agricultural, and environmental management.* Ancillary equipment includes computers, printers, scanners, applicable software, weather stations, other pertinent in situ measurements of the water balance and short time intensive field data collection programs and equipment required for the full functioning of the WISP tools. Local applications priorities, described in detail in Annex II, include identification of drought and flood prone areas, estimation of groundwater fluxes, estimation of evapotranspiration, monitoring climate change impacts, and crop yield estimates to inform agriculture and irrigation management decisions.

Component 2: Capacity Building and Project Management (US\$ 1.14 million)

22. *Component 2 will comprise: (a) capacity building (workshops and consultants) to implement WISP tools; (b) local workshops to share results with local stakeholders; (c) participation in international conferences and study tours on environmental remote sensing; (d) funding graduate fellowships; (e) development of an online national portal to share data across stakeholder institutions; and (f) project management of the Grant.*

APL1 covers activities under Components 1 and 2 for each of Lebanon, Jordan, Morocco and CRTEAN. APL2 will cover the same activities under Components 1 and 2 for Egypt.

Component 3: Regional Integration and Cooperation (US\$ 394,545)

23. *Component 3 will comprise: (a) organization of quarterly workshops to share results with regional stakeholders; (b) development of an online regional portal to share regional*

results; (c) generation of once-yearly regional report on applications of regional significance. These applications are expected to include estimating the recharge rates of regional oversubscribed shared aquifers, optimizing the response to droughts and floods on a regional scale, and encouraging a more coordinated approach to management of transboundary water resources among others.

B. Project Financing

Grant Instrument

24. The Grant instrument is a GEF Grant (designed along the guidelines of a horizontal Adaptable Program Loan APL) in the amount of US\$5.644 million which will be divided into six individual grants. The GEF Grant is from the Sustainable Mediterranean Program.

25. Following on the highly successful Mediterranean Environmental Technical Assistance Program (METAP) over the past 20 years, and in cooperation with beneficiary countries and relevant partners, the World Bank and the GEF have established a comprehensive new framework program – the *Environmental Mediterranean Sustainable Development Program*, “Sustainable MED” – to deal with issues related to natural resources, land degradation, solid and hazardous waste, and climate change. Sustainable MED is a natural follow-up program to METAP, although it is only a framework, and not a project/program to be submitted to the Bank’s Board. This new program will facilitate mainstreaming environmental issues in the economic development agenda of Mediterranean countries, following a shared common vision.

26. Sustainable MED is intended to leverage additional investments towards priority hotspots in the Mediterranean and will expand its scope to respond to the evolving landscape of environmental challenges in the region. In its first phase, Sustainable MED will comprise ten projects, including the Regional Coordination for Improved Water Resources Management project. It will prioritize projects with a high potential for replication and scale up.

Project Financing Table

27. Under APL-1, four Grants, each totaling US\$1,050,000, will be granted to each of Lebanon, Jordan, CRTEAN (for the benefit of Tunisia) and Morocco to finance goods and related installation services, consulting services, training, operating costs, workshops and scholarships under Components 1 and 2. An additional fifth Grant of US\$394,545 will be granted to the Arab Water Council to finance goods, consulting services, training, workshops and operating costs under Component 3 (see Table 2 below). Under APL-2, an additional Grant of US\$1,050,000 will be granted to Egypt to implement activities under Components 1 and 2 listed above.

IV. Implementation

A. Institutional and Implementation Arrangements

28. The Implementing Agencies are listed in Table 1 below.

Table 1: Implementing Agencies

	Implementing Agency
APL 1	
Lebanon	Conseil National de la Recherche Scientifique
Jordan	Ministry of Water and Irrigation
Morocco	Centre Royal de Télédétection Spatiale
For the benefit of Tunisia	Centre Régional de Télédétection des Etats d'Afrique du Nord
Regional Integration	Arab Water Council
APL 2	
Egypt	National Authority for Remote Sensing and Space Sciences

29. Within each implementing agency, a project management unit (PMU) will be established to: (i) manage the technical and fiduciary aspects of project implementation under Components 1 and 2; (ii) monitor and report on project outputs; (iii) coordinate with national stakeholders and; (iv) liaise with the Arab Water Council on the implementation of regional activities under Component 3. The PMU in each implementing agency will comprise a project coordinator, a procurement specialist and a financial management specialist.

30. As an established regional institution with proven capacity in gathering regional and international stakeholders within the water sector, the Arab Water Council will be the implementing agency responsible for the implementation of Component 3. As an established partner of various leading water institutions across MENA, AWC will play an important role in catalyzing knowledge sharing and cooperation.

31. The Arab Water Council will establish a Regional Project Management Unit (RPMU) which will be composed of one procurement specialist and one financial management specialist, a communications specialist and a project coordinator. The RPMU will be responsible for: (i) organizing yearly regional workshops; (ii) coordinate implementation of regional applications of WISP tools; (iii) compile a yearly regional report on local and regional research results; and (iv) liaise with individual PMUs on implementation of regional activities. The RPMU will also establish a Technical Advisory Committee (TAC) for review and guidance of the technical aspects of the projects. TAC will comprise: (i) a representative from NASA or associated partners; (ii) representatives from each participating country and (iii) representatives from local centers of expertise, such as the International Center for Agricultural Research in Dry Areas (ICARDA), International Center for Biosaline Agriculture (ICBA), or others as deemed appropriate.

Table 2: Program Costs (US\$) by Country and Component

			APL-1				APL-2
COMPONENTS	ACTIVITIES		LEBANON	MOROCCO	JORDAN	CRTEAN	EGYPT
Component 1: Improved Local Water Resources and Agricultural Management	Goods, Equipment and related installation services	Hardware, Software and Data to include MODIS Receiving station, field equipment, IT upgrades, software licenses, peripheral equipment, laboratory equipment and others	510,000	500,000	540,000	670,000	545,000
	Consultants	Technical assistance and training for the implementation of WISP applications	100,000	305,000	140,000	100,000	200,000
	Subtotal		610,000	805,000	680,000	770,000	745,000
	TOTAL Component 1		3,610,000				
Component 2: Capacity Building and Project Management	Goods and Consultants	PMU operations costs, publications, local workshops , travel, conference registration, online portal, scholarships among others	365,000	220,000	310,000	240,000	255,000
	Subtotal		365,000	220,000	310,000	240,000	255,000
	TOTAL Component 2		1,390,000				
	CONTINGENCY		75,000	25,000	60,000	40,000	50,000
	TOTAL GRANT PER COUNTRY		1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Component 3: Regional Integration and Cooperation	Equipment/Goods	PMU Operating costs, publications, regional workshops, translation, printing, travel, conference costs room rental and other costs	220,545				
	Consultants	Regional publication on impact of climate change on regional water resources, regional online data sharing portal, PMU consultants among others	144,000				
	CONTINGENCY		30,000				
	TOTAL Component 3		394,545				
Project Total	5,644,545						

B. Results Monitoring and Evaluation

32. Each PMU will collect and present data and reports for bi-yearly review and compilation by the RPMU in conjunction with World Bank supervision missions, as per the results indicator matrix in Annex I. Technical discussions during supervision missions will also provide an especially effective means of monitoring progress. The progress reports will be published by RPMU on its website, and will be accessible to managers and decision makers.

C. Sustainability

33. Sustainability of the proposed project will ultimately be determined by the established use of WISP tools for improved water resources management to inform infrastructure investment and impact policy reforms within the water sector. WISP tools will access and utilize remotely sensed data that is freely available in the public domain. By successfully demonstrating the capacity and relevance of WISP tools on various local and regional research applications and by linking to end-use stakeholders (Ministries of water, environment, urban planning, agriculture

etc.), implementing agencies will establish sustainable relationships between science applications, investment and policy. The extensive training, capacity building and data dissemination included in the project will play an important role in building the capacity of each implementing agency to this effect.

34. On a regional scale, project sustainability will largely be determined by the extent to which MENA countries adopt the methods and protocols for water data collection, measurement and management. To this effect, and by implementing the various WISP tools envisaged under the project, each implementing agency will utilize a common platform of satellite data. By maintaining (either through recruitment or training) a roster of highly qualified hydraulic modelers, earth scientists and remote sensing experts, it is likely that sharing scientific data on water across the MENA region for a common positive outcome will also become more accepted. Each implementing agency will list information it will share with other project countries in its Project Operations Manual (POM).

V. Key Risks

35. The project risks, which mostly center on weak technical capacity in remote sensing and an anticipated unfamiliarity with Bank procurement and financial management standards, will be mitigated by the extensive capacity building anticipated under the project. The overall project risks are rated Medium - Low Impact, and are considered manageable with mitigation measures in place. Potential risks and mitigation measures are summarized in the Operational Risk Assessment Framework (see Annex IV).

36. Other project risks include slow cooperation among the various stakeholders in sharing hydrological information. This risk will be mitigated by close Bank supervision, organizing regular progress workshops to national and regional water stakeholders and by providing frequent opportunities for knowledge sharing and exchange in an environment of technical and scientific rigour.

VI. Appraisal Summary

A. Economic Analysis

37. The Project is not amenable to a cost-benefit analysis, or financial analysis. The design of the Project however, has been based on the principle of cost-effectiveness through: (a) collaboration with NASA, which will provide the open source LDAS or other relevant software, in addition to technical assistance and capacity support to the various implementing agencies through parallel grant financing by USAID; and (b) the co-financing commitments made by each beneficiary country (which total over US\$ 10 million) which are a measure of the direct impact on the water sector in each beneficiary country as a result of the activities under the proposed project.

B. Technical

38. WISP tools to be implemented under the project include already established remote sensing techniques, digital image analysis tools, land surface models, and the land data assimilation system (LDAS) or other relevant software developed and widely used by NASA and its partners.

39. LDAS is designed to provide estimates of rainfall, runoff, soil moisture, evapotranspiration etc, at a variety of time and space scales (from 25 km to 1 km and 6 hours to 1 hour) and merges state of the art tools to operationally obtain high quality land surface storages and fluxes. The LDAS tool is thus particularly relevant to the MENA region which is characterized by a lack of traditional water balance data, high temporal and spatial variability in precipitation, large aquifers and intensive irrigation. Furthermore, LDAS is able to incorporate in-situ data traditionally collected by local and regional water institutions.

40. The project has been developed in coordination with NASA scientists and affiliated academic partners. NASA intends to make available the open-source LDAS and to provide technical assistance to project beneficiaries. NASA will finance the costs of its staff and the technical assistance it proposes. NASA has furthermore entered into an agreement with USAID to finance additional NASA-staff costs.

41. The Bank, under the proposed GEF Grants of the Sustainable Mediterranean Program, will finance all hardware and software requirements associated with the WISP tools, validation data and equipment as well as capacity building and training activities required for the full and sustainable operation of all WISP tools. The NASA satellite data required for the applications of water resources and agricultural management (such as MODIS data for example) is also available free of charge. Any other WISP tools such as drought monitoring, flash flood warning systems, land use/land cover mapping and evapotranspiration loss measurements among others will be procured under Grant financing and implemented in recipient countries. The GEF Grants will also fund regional integration and cooperation activities including yearly workshops, an online portal, and an annual regional report.

42. LDAS software is not essential to be provided by NASA in order for the project to reach a successful project outcome and therefore the project is not dependent on NASA's co-operation. Project implementation would not be irrevocably impacted should NASA's involvement be limited or end. This is because (i) independent qualified consultants (with direct LDAS experience) are capable of providing technical assistance to client countries; (ii) all countries will procure commercially available WISP tools. Rather, provision of LDAS software and related technical assistance by NASA would be an enhancement to the GEF project.

C. Financial Management

43. Financial management assessments were undertaken for each of the implementing agencies. The assessments identified implementing agencies' lack of experience with World Bank financial management standards as a risk. This risk will be mitigated by providing targeted

capacity building on Bank standards, close monitoring and supervision, and the recruitment of FM specialists to the PMU of each implementing agency.

D. Procurement

44. Procurement assessments were undertaken for each of the implementing agencies and identified implementing agencies' lack of experience with World Bank requirements as a significant risk. This risk will be mitigated by providing targeted capacity building on Bank requirements, close monitoring and supervision, and the recruitment of a procurement specialist to the PMU of each implementing agency.

45. Procurement for the proposed Project will be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants" by World Bank Borrowers published by the World Bank in January 2011 in the case of goods and non-consulting services, and Sections I and IV of the "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" published by the World Bank in January 2011 ("Consultant Guidelines") in the case of consultants' services..

46. For each contract, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements, and time frame have been agreed between the Grant Recipients and the Bank in the Procurement Plans available in project files.

E. Environment and Social

47. The project has been classified as Category C. O.P 4.12 is not triggered and no project Environmental Impact Assessment (EIA) is required. The project does not involve any physical works, will not have any adverse environmental impacts and does not involve any land acquisition or resettlement. When completed, the project will have significant positive social benefits, particularly for local farmers who depend on reliable water data in irrigation management, drought prevention and crop yield estimates.

Annex I: Results Framework and Monitoring

Project Development Objective (PDO):

The proposed project development objective is to improve water resources and agricultural management and planning within and across beneficiary countries, based on quantitative and spatial-based decision making tools.

PDO Level Results Indicators*	Core	Unit of Measure	Baseline	Cumulative Target Values**					Frequency	Data Source/ Methodology	Responsibility for Data Collection	Description (indicator definition etc.)
				YR 1	YR 2	YR3	YR 4	YR5				
WISP operational in at least three of four implementing agencies	<input type="checkbox"/>	Number of WISP systems operating	0	0	1	2	2	2	Bi-yearly	Qrtly	PMU	Technical specifications met
Number of major water resources decisions made in at least 3 of 4 beneficiary countries on improved agricultural and land use management taking into consideration outputs of WISP tools.	<input type="checkbox"/>	Number of major decisions made	0	0	1	2	3	4	Bi-yearly	Qrtly	PMU	
Regional project data portal developed and operational in all countries (according to IW:LEARN guidelines)	<input type="checkbox"/>	Project portal in operation	0	0	1	1	1	1	Bi-yearly	Qrtly	RPMU	IW Learn Guidelines applied, Number of hits to the website
INTERMEDIATE RESULTS												
Intermediate Result (Component One): Improved Local Water Resources and Agricultural Management												
WISP Hardware Purchased and Installed in at least 3 of 4 implementing agencies	<input type="checkbox"/>	No. of hardware installed	0	0	1	2	2	2	Bi-yearly	Qrtly	PMU	Technical specifications met
Number of remote sensing and stakeholder staff trained on use of WISP tools in each beneficiary country	<input type="checkbox"/>	No. of staff trained	0	3	6	9	12	15	Bi-yearly	Qrtly	PMU	

Intermediate Result (Component Two): Capacity Building and Project Management												
Scholarships for advanced study in environmental science, remote sensing techniques and/or other related subjects selected in each beneficiary country.	<input type="checkbox"/>	No. of scholars selected	0	0	2	4	4	4	Bi-yearly	Qrtly	PMU	As per selection criteria set out in POM
Local stakeholder workshops held in each beneficiary country.	<input type="checkbox"/>	No. of workshops held	0	1	2	3	5	6	Bi-yearly	Qrtly	PMU	
Intermediate Result (Component Three): Regional Integration and Cooperation												
Number of Regional Workshops held.	<input type="checkbox"/>	No. of workshops held	0	1	2	3	4	5	Bi-yearly	Qrtly	RPMU	
Number of Regional Reports on Impact of Climate Change on Regional Water Resources Published.	<input type="checkbox"/>	No. of Regional Reports	0	0	1	2	3	4	Bi-yearly	Qrtly	RPMU	

Annex II: Detailed Project Description

Description of Components

Component 1: Improved Local Water Resources Management

1. Component 1 will comprise: (a) the purchase, installation and validation of various WISP tools and other ancillary equipment in remote sensing centers in each of Lebanon, Jordan, Morocco, and CRTEAN and its partners (Tunisian Ministry of Agriculture and Hydraulic Resources, the Algerian National Agency for Hydraulic Resources and Tunisian National Center for Remote Sensing); and (b) the application of WISP tools to pertinent research issues in local and regional water resources management. Ancillary equipment includes satellite receiving stations, data servers, data storage, laboratory equipment, high resolution and meteorological data, computers, printers, scanners, applicable software and related licenses, field equipment, weather stations, other pertinent in situ measurements of the water balance and short time intensive field data collection programs, as well as, equipment required for the full functioning of WISP Tools.

2. Local application priorities identified by each implementing agency under Component 1 include the identification of drought and flood prone areas, estimation of groundwater fluxes, estimation of evapotranspiration, monitoring climate change impacts, and crop yield estimates to inform agriculture and irrigation management decisions, as described below:

- **Drought management.** Rainfall deficits across MENA will have different impacts depending upon meteorological conditions, ecosystem type, and social and economic circumstances. Remote sensing with modeling products provides significant enhancements in terms of spatial and temporal coverage in comparison to traditional ground-based measurement networks. These products include vegetation indices, surface drought wetness products and aquifer levels. WISP tools and data will be used to: (a) identify areas vulnerable to drought; (b) document historic trends; (c) enhance drought forecasting capacity; and (d) identify and institute alert systems to manage most vulnerable areas and provide improved desertification monitoring.
- **Estimation of groundwater fluxes.** WISP tools and data will be used to: (a) obtain optimal estimates of hydrological states and fluxes relevant to water resources at regional scale; (b) monitor changes in water availability, including surface water and ground water storage, river runoff, and related land use changes (vegetation, cropped areas, etc.) retrospectively and potentially in near real time; (c) directly track changes in water availability in the cases of very large aquifers through the capabilities afforded from NASA's GRACE satellite; and (d) provide the data needed to improve management and strengthen control of groundwater, including availability of groundwater and groundwater over-exploitation.
- **Estimation of evapotranspiration.** WISP tools and data will be used to: (a) identify and monitor irrigated areas by determining the difference in evapotranspiration between irrigated and non irrigated land; (b) develop a distribution of hydrological parameters

such as evaporative fraction, actual evapotranspiration; (c) develop optimized land cover/land use maps; and (d) develop regional evapotranspiration mapping to provide evapotranspiration estimate in the water balance component.

- **Monitoring climate change impacts.** WISP tools and data will be used to: (a) identify historic mean annual temperature and rainfall, and track historic fluctuations in temperature and precipitation; (b) identify supported trends, strengthen forecasting models and predict the regional hydrological impacts of climate change scenarios and (c) monitor regional precipitation distribution to provide early warning services using real time high resolution satellite based precipitation observation techniques and online mapping services.
- **Flood management.** WISP tools and data will be used to (a) identify areas vulnerable to floods and document historic trends; and (b) enhance flood forecasting capacity, identify and institute alert systems to manage the most vulnerable areas, and provide improved desertification monitoring.
- **Agriculture/Irrigation.** WISP tools and data will be used to (a) identify agricultural components (spatial crop distribution, production rate, water demand), agricultural water consumption, and changes in vegetation; and (b) generate detailed maps of soil moisture and vegetation to estimate water use for irrigation and maps of irrigated lands to monitor irrigation intensity and identify crop types in the MENA region's croplands.

3. The unique characteristic of LDAS is data assimilation, which enables models to use data from a variety of sources, spatial and temporal scales and accuracies to arrive at optimal estimates of model variables and states. Data assimilation is a numerical method by which two independent estimates of a variable can be combined to determine a best estimate, which is less uncertain than either of the two inputs. In this case, the variable is a land surface state such as soil moisture. One estimate comes from the land surface model and the other from a satellite observation. The error characteristics of each are used to weight their contributions to the final estimate.

4. Land surface models are not empirical, and simulations conserve both mass and energy. They can run in coupled (to an atmospheric model) or uncoupled (land only) mode. Initial LDAS models will be run in uncoupled mode, with no forecasting capability. In other words, they can run up to near real time, depending on the availability of the necessary observation-based input forcing data. One way in which the uncoupled LDAS can be run in a predictive mode is to use atmospheric forecasts, such as downscaled climate model scenarios, as forcing input.

5. LDAS can be configured to best suit the needs of a user and the nuances of a particular region. One can define the extent and spatial resolution of LDAS, from resolutions on the order of tens of meters to hundreds of kilometers, though the resolution should not be finer than the finest scale input dataset. The time period is only limited by that of the input forcing datasets. Given synthetic forcing datasets, such as those produced by climate models simulating various

climate change scenarios, LDAS could help plan possible water resource adaptations for practices such as irrigation scheduling and reservoir management.

Component 2: Capacity Building and Project Management

6. Component 2 will comprise: (a) capacity building (workshops and consultants) to implement WISP tools; (b) local workshops to share results with local stakeholders; (c) participation in international conferences and study tour on environmental remote sensing; (d) funding graduate fellowships; (e) development of a national online portal to share data across stakeholder institutions; and (f) project management of the Grant.

7. Graduate fellowships will finance tuition and living expenses of competitively selected graduate candidates to study environmental remote sensing and related academic subjects at local and international graduate institutions.

Component 3: Regional Integration and Cooperation

8. Component 3 will comprise: (a) organization of quarterly workshops to share results with regional stakeholders; (b) development of an online portal to share regional results; (c) generation of an annual regional report on applications of regional significance. These applications include estimating the recharge rates of regional oversubscribed shared aquifers, optimizing response to droughts and floods on a regional scale, and encouraging a more coordinated approach to management of transboundary water resources.

9. Detailed description of project activities per country

LEBANON
<p>▪ Drought Monitoring</p> <p>Rainfall deficits across Lebanon and its immediate region will have different impacts depending upon meteorological conditions, soils, crop type, and social and economic circumstances. Drought monitoring based on in situ measurements is challenging because of the large spatial variability of land cover, soils and micro climates. Remote sensing offers new capabilities for monitoring drought, both from direct sensing and from satellite developed products. These products include several types of vegetation indices and surface wetness products. WISP tools and data will be used to: (a) identify areas vulnerable to drought; (b) document historic trends; (c) enhance drought forecasting capacity; and (d) identify and institute alert systems for damage mitigation in the most vulnerable areas and provide improved desertification monitoring.</p>
<p>▪ Field Crop Yield Predictions of select water-intensive crops</p> <p>Early predictions of crop yields are important for economic management and food shortage mitigation plans. In many cases, lower than average crop yields are not known until after the fact when it is too late to implement mitigation steps. Remote sensing based water and energy balance information and direct measurements can be used to identify accumulated crop conditions that result in less than or more than average crop yields. The Ministry of Agriculture and CNRS will initiate a pilot project that will utilize near real time LDAS or other relevant</p>

software outputs of surface temperatures, soil moisture, precipitation and evapotranspiration. These data will be used to drive crop yield models for the selected crops.

▪ **Climate change analysis for examination of impact on water resources and impacts on rural development**

WISP tools and data will be used to define a baseline of historic mean annual temperature and rainfall and track historic fluctuations in temperature and precipitation. LDAS or other relevant software will provide a framework to project the impact of climate change scenarios of the region's water resources. Downscaled precipitation and temperature fields of scenarios taken from climate model projections will be used to drive LDAS or other relevant software to provide estimates of climate change impacts on Lebanon's water future water resources. Results of these models will identify those regions within the country that are projected to be most vulnerable to the impacts of climate change.

▪ **Forest fire early warning system and emergency preparedness pilots**

The MODIS active fire product detects fires in 1km pixels that are burning at the time of overpass under relatively cloud-free conditions using a contextual algorithm, where thresholds are first applied to the observed middle-infrared and thermal infrared brightness temperature; false detections are rejected by examining the brightness temperature relative to neighboring pixels. Burned areas are characterized by deposits of charcoal and ash, removal of vegetation, and alteration of vegetation structure. The MODIS algorithm used to map burned areas takes advantage of these spectral, temporal, and structural changes. It detects the approximate date of burning at 500 m by locating the occurrence of rapid changes in daily surface reflectance time series data. The algorithm maps the spatial extent of recent fires, but not of fires that occurred in previous seasons or years. Once near real time ability to download MODIS data from satellites has been achieved, CNRS will be able to adapt an active fire detection product for all of Lebanon.

MOROCCO

▪ **Assessment of climate change on the water and agricultural sectors**

The CRTS installed LDAS or other relevant software will be used to estimate key hydrologic parameters (precipitation, soil moisture, snowpack storage, evapotranspiration, runoff etc) to better characterize the water budgets on monthly and national scales. The water balance products will be provided based on compilation of past and current water conditions to better apprehend the past climate change impacts and contribute to improve the water resources management. Potentially, the downscaled hydrological parameters of scenarios taken from climate-model projections will be used as forcing inputs to drive the LDAS to predict the climate change impacts on Morocco's future water resources. The results of these model simulations will identify those regions within the country that are projected to be most vulnerable to the impacts of climate change.

▪ **Drought Monitoring**

Climate observation during the last 40 years have shown that Morocco is experiencing major impacts from climate change through increased temperatures and decreased precipitation. These conditions will become worse if the conclusions of the IPCC report of amplification and intensification of drought severity and frequencies are realized. This project proposes to develop

a comprehensive drought monitoring methodology based on satellite, in situ, and meteorological data. Remote sensing offers new capabilities for monitoring drought, both from direct sensing and from satellite developed products. These products include several types of vegetation indices and surface wetness products. WISP tools and data will be used to (i) identify areas vulnerable to drought (ii) document historic trends (iii) enhance drought forecasting capacity (iv) identify and institute alert systems for damage mitigation in the most vulnerable areas.

▪ **Locust Management and Control**

Locust outbreaks do occur throughout Africa and affect the livelihoods many people through the loss of food supplies. To prevent economic and environmental losses, locust breeding areas need to be periodically monitored, and an early detection-early response strategy should be in place. Traditional, ground survey methods are inefficient to adequately address the large spatial scale of the locust problem. Remote Sensing and the associated geospatial have been shown to assess the risk of impending locust outbreaks and the concomitant damage. This information could be used for targeted preventive management actions in the locust breeding areas. Remotely sensed data are used for monitoring habitats of certain species such as the Desert, Migratory and Australian Plague locusts. The possibility of merging a satellite based locust assessment with the LDAS based FEWS NET system will be explored to improve the capability for predicting outbreak conditions based on developing environmental and weather conditions.

▪ **Optimization of Irrigation Management**

Accurate and timely information on crop type and irrigation extent in Morocco is fundamental to many aspects of water resources management and climate change research. However, crop- and irrigation-related maps over large areas of the region are uncertain and available datasets are often outdated. Recently, NASA has developed algorithms to identify and map major crop types and agricultural management practices, including irrigation, directly from satellite remote sensing. To identify individual crop types, this procedure relies on the temporal information afforded by MODIS sensor data. To accomplish this a simple irrigation water requirements/use estimation algorithm is implemented within the LDAS framework. The irrigation algorithm combines the satellite-based extent of crop type and irrigation and ancillary information on agricultural practices (the type, timing, and efficiency of irrigation to be provided by the regional experts) to determine irrigation water requirements/use. The results from this effort will provide digital datasets on an annual basis for (1) total area of croplands; (2) planted area of major crops; and (3) extent of irrigation for each crop type. The specific applications models and indexes to be developed in this project, for each of the themes identified above, will be defined at the first phase of the project operational manual and with the collaboration of experts and consultants.

EGYPT

• **Assess the Impacts of Climatic Change on Water Resources**

LDAS or other relevant software based WISP tools and data will be used to define a baseline of historic mean annual temperature and rainfall, and track historic fluctuations in temperature and precipitation. Egyptian LDAS or other relevant software will provide a framework to project the impact of climate change scenarios of the region's water resources. Downscaled precipitation and temperature fields of scenarios taken from climate model projections will be used drive LDAS or other relevant software to provide estimates of the climate change impacts on Egypt's

future water resources. Results of these model simulations will identify those regions within the country that are projected to be most vulnerable to the impacts of climate change as well as indicate the relative impacts.

- **Monitor the Spatial and the Temporal Characteristics of Drought Events**

Rainfall deficits across Egypt and its immediate region will have different impacts depending upon meteorological conditions, soils, crop type, and social and economic circumstances. Drought monitoring based on in situ measurements is very difficult because of the large spatial variability of land cover, soils and micro climates. Remote sensing offers new capabilities for monitoring drought, both from direct sensing and from satellite developed products. These products include several types of vegetation indices and surface wetness products. WISP tools and data will be used to: (a) identify areas vulnerable to drought; (b) document historic trends; (c) enhance drought forecasting capacity; and (d) identify and institute alert systems for damage mitigation in the most vulnerable areas and provide improved desertification monitoring.

- **Assess the evaporation rates of Lake Nasser**

Lake Nasser is a large reservoir on the Nile River that provides water supply for major population centers, industry and intensive irrigated agriculture. Because of the reservoir's size, there is a wide distribution of surface temperatures across the surface. These are the results of wind initiated upwelling and seasonal inflows from the Nile. Accurate estimation of evaporation losses from its surface is important for managing reservoir releases and long term planning. Daily MODIS thermal measurements of the surface temperatures will provide important data on the spatial distribution of water temperatures. When combined with surface air temperatures, humidity and winds from mesoscale atmospheric forecast models, real time calculations of the evaporation losses will be possible.

- **Propose Water Management Strategies for Supporting the Agricultural Activities in the Egyptian Landscapes**

Accurate and timely information on crop type and irrigation extent in Egypt is fundamental to many aspects of water resources management. Recently, NASA has developed algorithms to identify and map major crop types and agricultural management practices, including irrigation, directly from satellite remote sensing. To identify individual crop types, this procedure relies on the temporal information afforded by MODIS sensor data. To accomplish this, a simple irrigation water requirements/use estimation algorithm is implemented within the LDAS or other relevant software framework. The irrigation algorithm combines the satellite-based extent of crop type and irrigation and ancillary information on agricultural practices (the type, timing, and efficiency of irrigation to be provided by the regional experts) to determine irrigation water requirements/use. The results from this effort will provide digital datasets on an annual basis for: (a) total area of croplands; (b) planted area of major crops; and (c) extent of irrigation for each crop type.

CRTEAN

As described in the joint proposal submitted by CRTEAN, the Tunisian Ministry of Agriculture, Hydraulic Resources, Agence Nationale de Ressources Hydrauliques in Algeria and Tunisian Centre National de la Cartographie et de la Télédétection (CNCT), the research initiative is to

provide time series changes in water availability in the local aquifers within Tunisia, and shared aquifers between Tunisia and Algeria. The initial area to be studied is the large aquifer north and west of Gafsa in Tunisia and extending into Algeria. GRACE satellite data extending back to its launch date will be used to quantify the total increases or decreases in the total water mass for this large region up to date and into the future. NASA Investigators have developed an approach for assimilating GRACE data into an LDAS model, producing estimates of variations in the components of terrestrial water storage that are both accurate and as high resolution as the model grid. GRACE-LDAS data are expected to show the large scale changes across political boundaries, and independent of local smaller scale ground water monitoring and modeling efforts currently underway. These local scale efforts are not able to depict the synoptic view of the aquifer dynamics necessary for large scale and long term management decisions. Validation with well and piezometer data and ground water modeling will play a major role in interpretation of GRACE results. In addition, the project will finance training workshops on environmental remote sensing to all CRTEAN member countries.

JORDAN

- **Drought Monitoring Across Jordan**

Rainfall deficits across Jordan will have different impacts depending upon meteorological conditions, soils, crop type, and social and economic circumstances. Drought monitoring based on in situ measurements is a very labor intensive process because of the large spatial variability of land cover, soils and micro climates. Remote sensing offers new capabilities for monitoring drought, both from direct sensing and from satellite developed products. In particular, real time MODIS data can track drought conditions through several remotely based drought observation models based on the response of vegetation reflectance to specific spectral bands. These products include several types of vegetation indices and surface wetness products. WISP tools and data will be used to: (a) identify areas vulnerable to drought; (b) document historic trends; (c) enhance drought forecasting capacity; and (d) identify and institute alert systems for damage mitigation in the most vulnerable areas and provide improved desertification monitoring.

- **Field Crop Yield Predictions of Select Water-intensive Crops**

Early predictions of crop yields are important for economic management and food shortage mitigation plans. In many cases lower than average crop yields are not known until after the fact when it is too late to implement mitigation steps. Remote sensing based water and energy balance information and direct measurements can be used to identify crop conditions that result in less than or more than average crop yields.

- **Climate Change Analysis for Examination of Impact on Water Resources**

The grid framework of LDAS is ideal for analyzing the impacts of climate change on water resources. Climate change models project temperature changes and an estimate of percentage changes in precipitation. What they do not do is predict how the changes are manifested into basic land surface hydrologic variables, such as soil moisture, runoff and ground water recharge. The LDAS or other relevant software will provide a framework to project the impact of climate change scenarios of the region's water resources. First, LDAS or other relevant software will be used to define a baseline of historic temperature and rainfall fluctuations. Then, downscaled precipitation and temperature fields of scenarios taken from climate model projections will be

used to drive LDAS or other relevant software to provide estimates of climate change impacts on Jordan's future water resources. Results of these model simulations will identify those regions within the country that are projected to be most vulnerable to the impacts of climate change, as well as its severity.

- **Quantifying Agricultural Water Use**

A method for quantifying irrigation and agricultural water use has been developed by NASA's collaborator, the University of Wisconsin. They have successfully developed mapping schemes for agricultural regions to quantify water use by irrigated agriculture. The innovative classification procedure involves merging high resolution data from Google Earth with moderate resolution, but high temporal resolution, data from MODIS and Landsat to identify crops from irrigated fields. This procedure maps irrigated fields, as well as changes in the water status of irrigated and rain fed fields.

ARAB WATER COUNCIL

The Arab Water Council will be the implementing agency responsible for the implementation of Component 3. The Arab Water Council will establish a Regional Project Management Unit (RPMU) composed of a procurement and a financial management specialist, a communications specialist and a project coordinator. The RPMU will be responsible for: (a) organizing yearly regional workshops; (b) coordinate the implementation of regional applications of WISP tools; (c) compiling an annual yearly regional report on local and regional research results; and (d) liaising with PMUs on implementation of regional activities. The RPMU will also establish a Technical Advisory Committee (TAC) for review and guidance of the technical aspects of the projects. The TAC will comprise: (a) a NASA representative; (b) representatives from each participating country; and (c) representatives from local centers of expertise.

Annex III: Implementation Arrangements

A. Project Administration Mechanisms

Project implementation and institutional arrangements

1. The Implementing Agencies and the respective project components to be implemented by each are listed in Table 1 below.

Table 1: Implementing Agencies

	Implementing Agency	Components 1 &2	Component 3
APL 1			
Lebanon	Conseil National de la Recherche Scientifique	√	
Jordan	Ministry of Water and Irrigation	√	
Morocco	Centre Royal de Télédétection Spatiale	√	
For the benefit of Tunisia	Centre Régional de Télédétection des Etats d'Afrique du Nord	√	
Regional Integration	Arab Water Council		√
APL 2			
Egypt	National Authority for Remote Sensing and Space Sciences	√	

2. Within each implementing agency, a project management unit (PMU) will be established to: (i) manage the technical and fiduciary aspects of project implementation under Components 1 and 2; (ii) monitor and report on project outputs; (iii) coordinate with national stakeholders and; (iv) liaise with the Arab Water Council (AWC) on the implementation of regional activities under Component 3. The PMU in each implementing agency will comprise a project coordinator, procurement specialist and a financial management specialist.

3. AWC will be the implementing agency responsible for the implementation of Component 3. AWC will establish a Regional Project Management Unit (RPMU) which will be responsible for; (i) organizing yearly regional workshops; (ii) coordinate the implementation of regional applications of WISP tools; (iii) compile a yearly regional report on local and regional research results. The RPMU will be composed of one procurement and one financial management specialist, a communications specialist and a project coordinator.

4. The RPMU will establish a Technical Advisory Committee (TAC) for review and guidance of the technical aspects of Components 1 and 2 of the project. TAC will comprise: (i) a NASA representative; (ii) representatives from each participating country; and (iii) representatives from local centers of expertise, such as the International Center for Agricultural Research in Dry Areas (ICARDA), the International Center for Biosaline Agriculture (ICBA) or others as deemed appropriate.

5. A Project Operation Manual (POM) will cover topics including project implementation arrangements, including inter-agency roles and responsibilities, procurement, disbursement and

financial management procedures, and the rules and procedures relating to the scholarship/fellowship program.

6. The Grant implementation arrangements are summarized in Figure 1 below:

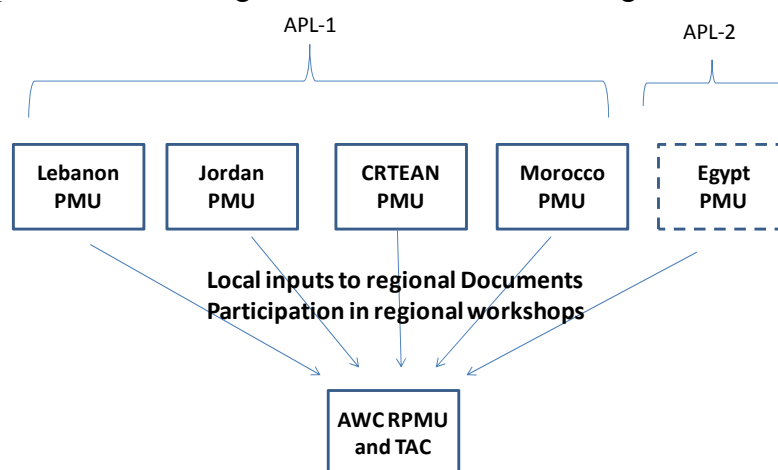


Figure 1: Grant Implementation Arrangements

B. Financial Management, Disbursements and Procurement

Financial Management

7. Financial management assessments were conducted for each of the implementing agencies in accordance with the Financial Management Manual for World Bank-Financed Investment Operations dated March 1, 2010 and MNAFM Financial Management Assessment and Risk Rating Principles. The assessment concluded that the financial management arrangements meet the Bank's minimum requirements under OP/BP10.02. The overall residual risk rating is moderate for AWC, NARSS, CRTEAN, MOWI, and CNRS, and low for CRTS. The project will thus have on-field supervision twice a year for the six implementing agencies. The financial management action plan outlines the mitigating measures, which, if implemented, would strengthen the financial management arrangements.

8. Budgeting arrangements

Morocco – Centre Royal de Teledetection Spatiale (CRTS): CRTS budget is financed through its own resources or from State subsidies. CRTS follows a budget accounting that tracks the financial performance both in terms of expenditure and receipts. In 2010, CRTS demonstrated satisfactory budget management.

Jordan – Ministry of Water and Irrigation (MOWI): Grants received are not included in the budget of MOWI but are included in the budget of the Ministry of Planning and International Cooperation (MOPIC). Accordingly, the project Grant will not be included in the MOWI budget and will be treated off the accounting records; however, internal procedures will still be applied on it.

Lebanon - Conseil National de la Recherche Scientifique (CNRS): CNRS budget is prepared on a yearly basis and covers the period spanning January 1 and ends on December 31. The CNRS budget does not include the grants received from external donors as these are extra budgetary resources. Detailed information on grants, in terms of allocation, commitments and disbursements, are reported on a separate statement that is prepared annually and submitted to the General Secretary for control and review.

Centre Regional de Teledetection des Etats d'Afrique du Nord (CRTEAN): CRTEAN budget is financed through annual membership fees paid by Member States and associated members. It also receives grants from the African Development Bank and UNESCO to finance some training sessions.

Arab Water Council (AWC): AWC in Egypt has limited budgeting capacity, especially for cash flow management. Therefore, the RPMU will be responsible for preparing the budget of the grant with the AWC financial management department. The required funds and projected disbursements will be revised.

NARSS: NARSS has limited budgeting capacity especially for cash flow management. Therefore, the PMU, through AWC finance department, will be responsible for preparing the budget of the grant. The required funds and projected disbursements will be revised on a semi-annual basis.

9. Accounting arrangements

CRTS: Project accounting will cover all sources and all uses of project funds, including payments and expenditures. All project transactions will be recorded in the project accounting system and will be reported separately from other CRTS activities. Accounting for the project will conform to the classification of expenditure and sources of funds indicated in project documents which is in accordance with the cash basis of accounting issued by international Public Sector Accounting Standards (IPSAS). The chart of accounts is expected to enter data in order to facilitate the financial monitoring of project expenditures by components, and by expenditure allocation and disbursement categories.

MOWI: MOWI uses an Oracle based accounting information system to account for financial transactions. However, since the grant is not included in the MOWI budget, a ring-fenced accounting and reporting system will be utilized to capture project financial transactions, which will serve as the base for the generation of interim unaudited financial reports (IFRs) and the annual financial statements. The format of the Interim unaudited Financial Reports (IFRs) was presented to the Head of financial and administrative affairs of MOWI and a copy will be provided to him and to the Financial Officer (FO) of MOPIC at Project effectiveness.

CNRS: CNRS uses the cash basis of accounting. It uses the Lebanese chart of accounts to record daily transactions and does not currently have a functional accounting information system. Accordingly, financial data are compiled manually on the "Grand Livre" and financial reports required as per the internal control law are prepared on excel sheets. For the purpose of this grant, a ring fenced accounting will be adopted where excel spreadsheets will be used to generate

the required interim IFRs. The documentation and supporting documents shall be maintained at CNRS for subsequent review and audit.

CRTEAN: CRTEAN does not have a computerized accounting system, as its accounting and financial reporting is entrusted to an accounting firm. All Grant transactions will be reported separately from other CRTEAN activities. Project accounting will conform to the classification of expenditure and sources of funds indicated in project documents in accordance with the cash basis of accounting issued by IPSAS. The chart of accounts is expected to enter data in order to facilitate the financial monitoring of project expenditures by components, and by expenditure allocation and disbursement categories.

AWC: AWC adopts the cash basis of accounting and depends mainly on manual bookkeeping in addition to the use of excel spreadsheets for reporting. Separate records will be opened to record Grant transactions in the manual accounting system and the Excel database will include a template for the IFRs required under the Grant agreement. All supporting documents will be kept separately within the AWC finance department.

NARSS: NARSS adopts the cash basis of accounting and depends mainly on manual bookkeeping in addition to the use of excel spreadsheets for reporting. Separate records will be opened to record Grant transactions in the manual accounting system and the Excel database will include a template for the IFRs required under the Grant agreement. All supporting documents will be kept separately within the NARSS finance department.

10. **Internal control.** CRTS, CRTEAN, MOWI, CNRS, and AWC each have adequate internal controls in place, including approval and authorization of transactions and segregations of duties, as assessed by the individual financial management assessments conducted as part of project preparation (available in project files Financial Management Assessment Reports).

11. For NARSS, internal control weaknesses were noted during the FM assessment which may affect proper segregation of duties and efficient management of the grant funds. To mitigate these weaknesses it was agreed with the NARSS General Manager of Financial Affairs that the following measures will be carried out i) separate filing will be made for the TF proceeds and expenditures supporting documents and all original supporting documents will be maintained in a traceable and organized manner by the TF accountant within the Finance Department, ii) A TF responsible accountant with acceptable experience and qualification will be assigned before effectiveness to handle the recording of the project FM transactions and ensure proper segregation of duties is maintained, iii) a financial manual will be prepared before effectiveness by the Financial and Administrative Manager depicting the controls that will be applied over the use of funds.

12. **Funds flow and disbursement arrangements**

Flow of funds and disbursement and arrangements: The proceeds of the Grant will be disbursed in accordance with the traditional disbursement procedures of the Bank i.e., Advances, Direct Payment, Reimbursement, and Special Commitment, accompanied by appropriate supporting documentation (Summary Sheets with records and/or Statement of Expenditures

(SOE's)) in accordance with the procedures described in the Disbursement Letter for each implementing agency and the Bank's "Disbursement Guidelines". The minimum application size for direct payment, reimbursement and special commitment will be the equivalent of 20% of the Advance ceiling amount. There will be no retroactive financing and there are no disbursement conditions.

The Bank will honor eligible expenditures for services rendered and goods delivered by the Project closing date. A four months' grace period will be granted to allow for the payment of any eligible expenditure incurred before the Grant closing date.

Designated Account: Each PMU will open a segregated Designated Account (DA) at a Commercial or Central Bank, acceptable to the World Bank, denominated in US Dollars to cover the Grant's share of eligible project expenditures. The ceiling of the Designated Account would be 10% of the Grant. Each PMU will be responsible for submitting monthly replenishment applications with appropriate supporting documentation.

Statement of Expenditure: Necessary supporting documents will be sent to the Bank contract that are above the prior review threshold. Expenditures under contracts with an estimated value of: (a) US\$100,000 or less for goods; (b) US\$100,000 or less for consulting firms; (c) US\$50,000 or less for individual consultants, as well as training, operating costs, workshops and scholarships, will be claimed on the basis of SOEs. The supporting documentation will be retained at the respective PMUs and will be readily accessible for review by external auditors and by Bank supervision missions. All disbursements will be subject to the conditions of the Grant Agreement, and the disbursement procedures defined in the Disbursement Letters.

13. **Financial reporting arrangements.** Each implementing agency PMU will prepare semi-annual un-audited IFRs for the project in form and content satisfactory to the Bank, which will be submitted to the Bank within 45 days after the end of the period to which they relate. The contents and format of the IFRs were discussed with each PMU. These reports, which are in compliance with the cash basis of accounting as per International Public Sector Accounting Standards (IPSAS), should include: (a) "Statement of Cash receipts and Payments by component and by category for the period covered and a cumulative figures"; and (b) accounting policies adopted and explanatory notes to PFS as follows:

- Statement for expenditures made under SOE;
- Statement of ongoing commitments; and
- Statement of reconciliation of the Designated Account (DA)
- Statement of Fixed assets.

14. **Audits of Project Financial Statements.** At each PMU/implementing level, an external auditor will be appointed according to term of references acceptable to the Bank and will conduct the audit in accordance with international auditing standards. The auditor should produce: (i) an annual audit report, including his opinion on the project annual financial statements; and (ii) a management letter on the project internal controls. These reports should be submitted to the World Bank within six months from the closure of each fiscal year.

15. The scope of World Bank supervision missions will be adapted to the needs of the project. Based on the on the FM performance rating of each sub-project, supervisory frequency will be once to twice per year, though this may be increased if needed.

Procurement

16. Procurement assessments were conducted for each of the implementing agencies. The assessment concluded that the procurement arrangements meet the Bank's minimum requirements under OP/BP10.02. The overall residual risk rating is moderate for AWC, NARSS, CRTEAN, MOWI, and CNRS, and low for CRTS. The project will thus have on-field supervision twice a year for the six implementing agencies.

17. Procurement for the proposed Project will be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants" by World Bank Borrowers published by the World Bank in January 2011 in the case of goods and non-consulting services, and Sections I and IV of the "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" published by the World Bank in January 2011 ("Consultant Guidelines") in the case of consultants' services.

18. **Procurement of Goods.** Goods procured under this project will include satellite receiving stations, data, field equipment, laboratory equipment, IT system upgrades, data storage and server equipment, and other related equipment using the Bank's SBD for all ICB packages and national SBDs acceptable to the Bank for NCBs.

19. **Selection of Consultants** includes: individuals and firms for technical assistance, editing, publishing and training, as specified under Component 1, 2 and 3. In addition, individual consultants will be selected to strengthen project implementation capacity. Short lists of consulting firms for services estimated to cost less than US\$200,000 equivalent per contract may be composed entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. The short lists should normally be composed of firms of similar experience or of not for profit organizations (NGOs, Universities, UN Agencies, etc.) acting in the same field of expertise. If mixing is used, the selection should be made using Quality Based Selection. The short lists shall not include Individual Consultants.

	Procurement Method Thresholds Proposed (USD Million)									
	ICB	NCB	Shopping	QCBS	QBS	CQS	LCS	SSS	FBS	DC
Goods	NA	<1	<0.250							
Works	NA	<1	<0.250							
Consulting Services	NA			Default	TBD	<0.20	TBD	TBD	TBD	TBD

20. **Procurement Plans and Procurement Arrangements.** Procurement Plans for the project, prepared by each implementing agency, have been reviewed by the Bank and accepted. These plans (available in project files) will be updated annually to reflect the latest circumstances.

Environmental and Social Safeguards

21. As discussed in paragraph 47 of the main text above.

Monitoring and Evaluation

22. As discussed in paragraph 32 of the main text above.

Annex IV Operational Risk Assessment Framework (ORAF)

LEBANON, JORDAN, MOROCCO, CRTEAN AND ARAB WATER COUNCIL
REGIONAL COORDINATION ON IMPROVED WATER RESOURCES MANAGEMENT AND CAPACITY BUILDING

Project Development Objective(s)	
The proposed project development objective is to improve water resources and agricultural management and planning within and across Project countries, based on quantitative and spatial-based decision making tools.	
PDO Level Results Indicators:	<ul style="list-style-type: none"> WISP operational in each implementing agency WISP operational in at least 3 of 4 implementing agencies Number of major water resources decisions made taking into consideration WISP tools. Regional project data portal developed and operational (according to IW:LEARN guidelines)

Risk Category	Risk Rating	Risk Rating Explanation	Risk Description	Proposed Mitigation Measures	Timing for Mitigation: Prep/Impl.	
1. Project Stakeholder Risks						
1.1 Stakeholder	M-H	Various stakeholders may display a lack of willingness to cooperate in sharing hydrological information within and across stakeholder groups.	Sensitivity of water data may preclude effective cooperation and data sharing (i) within stakeholders and (ii) among nations.	The World Bank will work with each implementing agency to develop and implement the POM in order to establish the nature and frequency of information exchanged. The Technical Advisory Committee (TAC) established within the AWC RPMU will also play an important role in (i) providing technical advice where appropriate/requested on various water issues and (ii) maintaining communication channels among countries.		Impl

2. Operating Environment Risks						
2.1 Country/Regional	M-H	Regional tensions in the Middle East as potential obstacles to sustainable operations.	Sustained regional political uncertainties and tensions could preclude Grant effectiveness and effective project implementation.	The Bank will continue to monitor local developments and appropriately adjust its program as may be appropriate. Upon the Government of Egypt's readiness to negotiate the Grant Agreement, APL-2 will be triggered and the Grant will be submitted to the MNA RVP for approval.	Prep.	Impl.
2.2 Institutional (sector & multi-sector Level)	M-L	Ineffective/incomplete use of data to inform policy decisions within local stakeholder agencies (i.e. agriculture, environment)	Project outputs (maps, data sets etc) may be too technically elaborate to effectively inform and impact policy reform in the water and irrigation sectors. Policy and infrastructure decisions based on datasets collected and validated would therefore lag.	The capacity building activities proposed under Component 2 will focus specifically on ways in which the data generated from the proposed project can most significantly impact high level decision making within targeted sectors. Affected ministries will be invited to participate in regional workshops and will also be requested for feedback in the selection of country specific applications under Component 1.		Impl.
3. Implementing Agency Risks						
3.1 Capacity	M-H	Project delays due to weak procurement and financial management capacity.	Certain implementing agencies may be unfamiliar with Bank procurement and financial management standards. This could negatively impact project implementation due to the need for additional targeted training.	Qualified procurement and financial management specialists will be recruited/appointed to the PMU of each implementing agency. Country based Bank		Impl

	M-H	Weak capacity to monitor water resources and use collected data.	Certain implementing agencies may not have the technical staff required to install and utilize the various WISP tools proposed under the project. This could adversely delay project implementation particularly over the first year.	<p>staff will also be available to assist the PMU's in World Bank Procurement and FM standards.</p> <p>Component 2 will focus exclusively on building the capacity of implementing agencies in the collection and use of collected data. The Technical Advisory Committee will organize frequent regional technical workshops and discussion forums to ensure capacity building.</p>		Impl.
4. Project Risks						
4.1 Design	M-L	The surface areas of certain countries area of interest may be too small for the application of certain satellite observation tools.	Certain WISP tools have been successfully applied over large surface areas (across the entire mid-west US for example) and have not been tested as rigorously over smaller surface areas. These tools will need to be modified to be applicable over smaller surface areas.	The NASA team has designed and developed WISP tools (the LDAS or other relevant software) specifically adapted to the topology of the proposed countries. Furthermore, the capacity building workshops will focus specifically on ways in which to optimize the use of WISP tools in the MENA context. NASA staff and experts will provide this training and will assist recipient agencies to tailor the WISP tools to individual areas and climatic conditions.		Impl.
4.2 Environmental Safeguards	L	Risks associated with an improperly implemented Environmental Management Plan (EMP)		The project has been categorized as Category C. An EMP is thus not required. The Bank team will monitor implementation closely and		

				will reassess the need for any environmental management plan if necessary.		
4.3 Program & Donor	M-I	Risk of NASA disengaging from the project .	NASA's engagement (both in staff and resources) on the project may vary over the project implementation period.	<p>During project preparation, the Bank exchanged letter agreements with NASA clarifying the intention of both institutions to implement the project fully. Nonetheless, project implementation would not be irrevocably impacted should NASA's involvement on the project be limited or end. This is because (i) independent qualified consultants (with direct LDAS or other relevant software experience) are capable of providing technical assistance to client countries; (ii) all countries will procure commercially available WISP tools and (iii) disbursements, or delays in disbursements in one country will not automatically impact disbursements in any other recipient country because each country will have a separate Grant Agreement. NASA involvement would be an enhancement rather than a necessity. Furthermore, all NASA satellite data is in the public domain and available free of charge on the internet.</p>	Prep	Impl

4.4 Delivery Quality	L-H	Incorrect/incomplete validation of collected data used to erroneously inform policy and/or infrastructure decisions.	Risk of data collected using various WISP tools not being thoroughly validated for error prior to use as a baseline. This could potentially lead to misinforming policy and infrastructure decisions with potentially negative impacts in the medium and short-term and associated reputational risk to both the World Bank, NASA and all technical consultants involved in project implementation.	The Bank team will monitor the technical aspects of implementation very closely and will ensure that an expert with Earth observation expertise (from NASA or other as appropriate), joins supervision missions as necessary and reviews technical progress reports submitted. Components 1 and 2 will finance individual consultants and technical experts to assist each implementing agency with manipulating and validating data collected under the newly installed WISP systems, thereby greatly reducing the margin for error. The project will also finance targeted regional workshops to build capacity on best practices for WISP use.		Impl.
	Risk Rating: Preparation	Risk Rating: Implementation	Processing Track	Date	Comments	
Overall Risk	L	M	1	May 11. 2011		

Annex V: Implementation Support Plan

Strategy and Approach for Implementation Support

1. The strategy for implementation support has been developed based on the nature of the project and its risk profile. It will aim at making implementation support to the implementing agencies more flexible and efficient, and will focus on implementation of the risk mitigation measures defined in the ORAF as well as the traditional supervision focus areas including fiduciary aspects.
2. Formal supervision and field visits will be carried out semi-annually, and will focus on:
 - (a) **Technical inputs.** Technical inputs are required to review bid documents, monitor quality of data and reports generated by various WISP tools and ensure fair competition through proper technical specifications and fair assessment of the technical aspects of bids. Technical experts from NASA and affiliated institutions will participate in Bank supervision missions and provide technical assistance to implementing agencies as required.
 - (b) **Fiduciary requirements and inputs.** Training will be provided by the Bank's financial management specialist and the procurement specialist before the commencement of project implementation. The team will support the implementing agencies in their financial management capacity and to improve procurement management efficiency. The financial management specialist and the procurement specialist for each recipient country will be based in the country office to provide timely support. Supervision of financial management arrangements will be carried out semi-annually as part of the project supervision plan and support will be provided on a timely basis to respond to client needs. Procurement supervision will be carried out on a timely basis as required by the client.
 - (c) **Client Relations.** The Task Team Leader will coordinate the Bank team to ensure project implementation is consistent with Bank requirements, as specified in the legal documents. S/he will meet with senior officials on a regular basis to keep them apprised of project progress and issues requiring resolution at their level.

Implementation Support Plan

3. Staff skill mix required is summarized below.

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task Team Leader	6 SWs annually	Two each year.	
Procurement Specialists	24 SWs annually (4 SWs x 6 implementing agencies)	Fields trips as required.	Country office-based
Financial Management Specialists	12 SWs annually (2 SWs x 6 implementing agencies)	Fields trips as required.	Country office-based
Technical Specialists	12 SWs annually	Fields trips as required	

Annex VI: Team Composition

World Bank staff and consultants who worked on the project:

Claire A. Kfourri	Task Team Leader, Water and Sanitation Specialist	MNSWA
Jean Charles De Daruvar	Senior Counsel	LEGEM
Julie Rieger	Counsel	LEGEM
Ignacio Jauregui	Counsel	LEGEM
Sergio Margulis	Program Manager	MNSEN
Kanta K. Rigaud	Lead Environmental Specialist	MNSEN
Hyacinth Brown	Senior Finance Officer	CTRFC
Hassine Hedda	Finance Officer	CTRFC
Raja Iyer	Consultant/Operation Adviser	MNSSD
Ahmedou Ahmed	Lead Procurement Specialist	MNAPR
Sepehr Fotovat	Senior Procurement Specialist	MNAPR
Badr Kamel	Senior Procurement Specialist	MNAPR
Lina Fares	Senior Procurement Specialist	MNAPR
Ghada Shaqour	Procurement Specialist	MNAPR
Abdoulaye Keita	Procurement Specialist	MNAPR
Walid Dhouibi	Procurement Specialist	MNAPR
Mona El Chami	Senior Financial Management Specialist	MNAFM
Rima Koteiche	Senior Financial Management Specialist	MNAFM
Anas Abou Al Mikias	Senior Financial Management Specialist	MNAFM
Wael Elshabrawy	Financial Management Specialist	MNAFM
Moez Makhoul	Financial Management Specialist	MNAFM
Heba Ahmed	Water and Sanitation Specialist	MNSWA
Song Li	ET Consultant	MNSEN
Anjum Rosha	ET Consultant	LEGEM
Sanne Agnete Tikjoe	ET Consultant	MNSEN
Dr. Edwin Engman	Consultant	MNSWA
Zaileen Rahim	Consultant	MNSWA
Georgine Seydi	Language Program Assistant	MNSSD
Magalie Pradel	Language Program Assistant	MNSSD
Angeline Mani	Language Program Assistant	MNSSD
Josephine Onwumene	Information Assistant	MNSSD
Anthony Bigio	Peer Reviewer	FEU
Maged Hamed	Peer Reviewer	MNSEN
Parameswaran Iyer	Peer Reviewer	MNSWA